# ADDENDUM B
# WASTE ANALYSIS PLAN

This page intentionally left blank.

# ADDENDUM B
# WASTE ANALYSIS PLAN

## CONTENTS

B. WASTE ANALYSIS PLAN .......... 4
B.1 Introduction .......... 5
B.1.1 Liquid Effluent Retention Facility and Effluent Treatment Facility Description .......... 6
B.1.2 Sources of Aqueous Waste .......... 7
B.2 Influent Waste Acceptance Process .......... 8
B.2.1 Waste Information .......... 8
B.2.2 Waste Management Decision Process .......... 11
B.2.3 Periodic Review Process .......... 16
B.2.4 Record/Information and Decision .......... 16
B.3 Special Management Requirements .......... 18
B.3.1 Land Disposal Restriction Compliance at Liquid Effluent Retention Facility .......... 18
B.4 Influent Aqueous Waste Sampling and Analysis .......... 19
B.4.1 Sampling Procedures .......... 19
B.4.2 Analytical Rationale .......... 19
B.5 Treated Effluent Sampling and Analysis .......... 21
B.5.1 Rationale for Effluent Analysis Parameter Selection .......... 21
B.5.2 Effluent Sampling Strategy: Methods, Location, Analyses, and Frequency .......... 22
B.6 Effluent Treatment Facility Generated Waste Sampling and Analysis .......... 22
B.6.1 Secondary Waste Generated from Treatment Processes .......... 23
B.6.2 Operations and Maintenance Waste Generated at the 200 Area Effluent Treatment Facility .......... 26
B.6.3 Other Waste Generated at the 200 Area Effluent Treatment Facility .......... 26
B.7 Quality Assurance/Quality Control .......... 27
B.7.1 Project Management .......... 27
B.7.2 Data Quality Parameters and Criteria .......... 28
B.7.3 Data Generation and Acquisition .......... 30
B.7.4 Assessment and Oversight .......... 31
B.7.5 Verification and Validation of Analytical Data .......... 31
B.8 REFERENCES .......... 32
B.9 Analytical Methods, Sample Containers, Preservative Methods, and Holding Times .......... 33

## FIGURES

Figure B.1. 200 Area Effluent Treatment Facility Floor Plan .......... 10

## TABLES

Table B.1. General Limits for Liner Compatibility .......... 17
Table B.2. Waste Acceptance Criteria .......... 18
Table B.3. Target Parameters for Influent Aqueous Waste Analyses .......... 21
Table B.4. Rationale for Parameters to be Monitored in Treated Effluent .......... 24
Table B.5. 200 Area Effluent Treatment Facility Generated Waste - Sampling and Analysis .......... 27
Table B.6. Sample and Analysis Criteria for Influent Aqueous Waste and Treated Effluent .......... 33
Table B.7. Sample Containers, Preservative Methods, and Holding Times for 200 Area ETF Generated Waste .......... 37

## B. WASTE ANALYSIS PLAN

### Metric Conversion Chart

| Into metric units | | | Out of metric units | | |
|---|---|---|---|---|---|
| If you know | Multiply by | To get | If you know | Multiply by | To get |
| Length | | | Length | | |
| inches | 25.40 | millimeters | millimeters | 0.0393 | inches |
| inches | 2.54 | centimeters | centimeters | 0.393 | inches |
| feet | 0.3048 | meters | meters | 3.2808 | feet |
| yards | 0.914 | meters | meters | 1.09 | yards |
| miles | 1.609 | kilometers | kilometers | 0.62 | miles |
| Area | | | Area | | |
| square inches | 6.4516 | square centimeters | square centimeters | 0.155 | square inches |
| square feet | 0.092 | square meters | square meters | 10.7639 | square feet |
| square yards | 0.836 | square meters | square meters | 1.20 | square yards |
| square miles | 2.59 | square kilometers | square kilometers | 0.39 | square miles |
| acres | 0.404 | hectares | hectares | 2.471 | acres |
| Mass (weight) | | | Mass (weight) | | |
| ounces | 28.35 | grams | grams | 0.0352 | ounces |
| pounds | 0.453 | kilograms | kilograms | 2.2046 | pounds |
| short ton | 0.907 | metric ton | metric ton | 1.10 | short ton |
| Volume | | | Volume | | |
| fluid ounces | 29.57 | milliliters | milliliters | 0.03 | fluid ounces |
| quarts | 0.95 | liters | liters | 1.057 | quarts |
| gallons | 3.79 | liters | liters | 0.26 | gallons |
| cubic feet | 0.03 | cubic meters | cubic meters | 35.3147 | cubic feet |
| cubic yards | 0.76456 | cubic meters | cubic meters | 1.308 | cubic yards |
| Temperature | | | Temperature | | |
| Fahrenheit | subtract 32 then multiply by 5/9ths | Celsius | Celsius | multiply by 9/5ths, then add 32 | Fahrenheit |
| Force | | | Force | | |
| pounds per square inch | 6.895 | kilopascals | kilopascals | 1.4504 x $10^{-4}$ | pounds per square inch |

Source: *Engineering Unit Conversions*, M. R. Lindeburg, P.E., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

## B.1 Introduction

In accordance with the regulations set forth in the Washington State Department of Ecology (Ecology) *Dangerous Waste Regulations*, Washington Administrative Code (WAC) 173-303-300, this waste analysis plan (WAP) has been prepared for operation of the Liquid Effluent Retention Facility (LERF) and the 200 Area Effluent Treatment Facility (200 Area ETF) located in the 200 East Area on the Hanford Site, Richland, Washington.

The purpose of this WAP is to ensure that adequate knowledge as defined in WAC 173-303-040, is obtained for dangerous and/or mixed waste accepted by and managed in LERF and 200 Area ETF. This WAP documents the sampling and analytical methods, and describes the procedures used to obtain this knowledge. This WAP also documents the requirements for generators sending aqueous waste to the LERF or 200 Area ETF for treatment. Throughout this WAP, the term generator includes any Hanford Site source, including treatment, storage, and disposal (TSD) units, whose process produces an aqueous waste.

LERF consists of three surface impoundments, which provide treatment and storage. The 200 Area ETF includes a tank system, which provides treatment and storage, and a container management area, which provides container storage and treatment. Additionally, this WAP discusses the sampling and analytical methods for the treated effluent (treated aqueous waste) that is discharged from 200 Area ETF as a non-dangerous, delisted waste to the State Approved Land Disposal Site (SALDS). Specifically, the WAP contains sampling and analysis requirements including quality assurance/quality control requirements, for the following:

- Influent Waste Acceptance Process - determines the acceptability of a particular aqueous waste at the LERF or 200 Area ETF pursuant to applicable Permit conditions, regulatory requirements, and operating capabilities prior to acceptance of the waste at the LERF or 200 Area ETF for treatment or storage. This includes documenting that wastes accepted for treatment at ETF are within the treatability envelope required by the Final Delisting 200 Area ETF, Permit Condition 1.a.i. Refer to Section B.2.
- Special Management Requirements - identifies the special management requirements for aqueous wastes managed in the LERF or 200 Area ETF. Refer to Section B.3.
- Influent Aqueous Waste Sampling and Analysis - describes influent sampling and analyses used to characterize an influent aqueous waste to ensure proper management of the waste and for compliance with the special management requirements. Also includes rationale for analyses. Refer to Section B.4.
- Treated Effluent Sampling and Analysis - describes sampling and analyses of treated effluent (i.e., treated aqueous waste) for compliance with Washington State Waste Discharge Permit, No. ST 4500 (Ecology 2000); and Final Delisting 200 Area ETF [40 CFR 261, Appendix IX, Table 2 and the corresponding State Final Delisting issued pursuant to WAC 173-303-910(3) limits. Also includes rationale for analyses. Refer to Section B.5.
- 200 Area ETF Generated Waste Sampling and Analysis - describes the sampling and analyses used to characterize the secondary waste streams generated from the treatment process and to characterize waste generated from maintenance and operations activities. Also includes rationale for analyses. Characterization and designation of wastes generated from maintenance and operations activities are conducted pursuant to WAC 173-303-170 and are not subject to the permit requirements of WAC 173-303-800. These descriptions are included in this WAP for purposes of completeness, but are not enforceable conditions of this WAP or the permit. Refer to Section B.6.
- Quality Assurance and Quality Control - ensures the accuracy and precision of sampling and analysis activities. Refer to Section B.7.

This WAP meets the specific requirements of the following:

- Land Disposal Restrictions Treatment Exemption for the LERF under 40 CFR 268.4, U.S. Environmental Protection Agency (EPA), December 6, 1994 (EPA 1994)
- Final Delisting 200 Area ETF [40 CFR 261, Appendix IX, Table 2
- Corresponding State Final Delisting issued pursuant to WAC 173-303-910(3)
- Washington State Waste Discharge Permit (No. ST 4500), as amended
- Hanford Facility Dangerous Waste Permit (Permit) WA7890008967, as amended.

The Permit conditions of the Washington State Waste Discharge Permit (No. ST 4500) are included in this WAP for completeness, as well as generator requirements for designation of wastes generated by LERF and 200 Area ETF from operation and maintenance activities. The Washington State Waste Discharge Permit (No. ST 4500) Conditions are not within the scope of RCRA or WAC 173-303 or subject to the permit requirements of WAC 173-303-800. Therefore, revisions of this WAP that are not governed by the requirements of WAC 173-303 will not be considered as a modification subject to review or approval by Ecology. Any other revisions to this WAP will be incorporated through the Permit modification process as necessary to demonstrate compliance with requirements of this Permit, including Permit Conditions I.E.7 and I.E.8.

### B.1.1 Liquid Effluent Retention Facility and Effluent Treatment Facility Description

The LERF and 200 Area ETF comprise an aqueous waste treatment system located in the 200 East Area. Both LERF and 200 Area ETF may receive aqueous waste through several inlets. 200 Area ETF can receive aqueous waste through three inlets. First, 200 Area ETF can receive aqueous waste directly from the LERF. Second, aqueous waste can be transferred from the Load-in Station to 200 Area ETF. Third, aqueous waste can be transferred from containers (e.g., carboys, drums) to the 200 Area ETF through either the Secondary Waste Receiving Tanks or the Concentrate Tanks. The Load-in Station is located just east of 200 Area ETF and currently consists of three storage tanks and a pipeline that connects to either LERF or 200 Area ETF through fiberglass pipelines with secondary containment.

The LERF can receive aqueous waste through four inlets. First, aqueous waste can be transferred to LERF through a dedicated pipeline from the 200 West Area. Second, aqueous waste can be transferred through a pipeline that connects LERF with the 242-A Evaporator. Third, aqueous waste also can be transferred to LERF from a pipeline that connects LERF to the Load-in Station at 200 Area ETF. Finally, aqueous waste can be transferred into LERF through a series of sample ports located at each basin.

The LERF consists of three lined surface impoundments with a nominal capacity of 29.5 million liters each. Aqueous waste from LERF is pumped to 200 Area ETF through a double walled fiberglass pipeline. The pipeline is equipped with leak detection located in the annulus between the inner and outer pipes. Each basin is equipped with six available sample risers constructed of 6-inch-perforated pipe. A seventh sample riser in each basin is dedicated to influent waste receipt piping, and an eighth riser in each basin contains liquid level instrumentation. Each riser extends along the sides of each basin from the top to the bottom of the basin. Detailed information on the construction and operation of the LERF is provided in Addendum C, Process Information.

200 Area ETF is designed to treat the contaminants anticipated in process condensate from the 242-A Evaporator and other aqueous wastes from the Hanford Site. Section B.1.2 provides more information on the sources of these wastes.

The capabilities of 200 Area ETF were confirmed through pilot plant testing. A pilot plant was used to test surrogate solutions that contained constituents of concern anticipated in aqueous wastes on the Hanford Site. The pilot plant testing served as the basis for a demonstration of the treatment capabilities of 200 Area ETF in the *200 Area Effluent Treatment Facility Delisting Petition* (DOE/RL-92-72).

200 Area ETF consists of a primary and a secondary treatment train (Figure B.1). The primary treatment train removes or destroys dangerous and mixed waste components from the aqueous waste. In the

secondary treatment train, the waste components are concentrated and dried into a powder. This waste is containerized, and transferred to a waste treatment, storage, and/or disposal (TSD) unit.

Each treatment train consists of a series of operations. The primary treatment train includes the following:

- surge tank
- Filtration
- Ultraviolet light oxidation (UV/OX)
- pH adjustment
- Hydrogen peroxide decomposition
- Degasification
- Reverse osmosis (RO)
- Ion exchange
- Final pH adjustment and verification

The secondary treatment train uses the following:

- Secondary waste receiving
- Evaporation (with mechanical vapor recompression)
- Concentrate staging
- Thin film drying
- Container handling
- Supporting systems

A dry powder waste is generated from the secondary treatment train, from the treatment of an aqueous waste. The secondary waste treatment system typically receives and processes by-products generated from the primary treatment train. However, in an alternate operating scenario, some aqueous wastes may be fed to the secondary treatment train before the primary treatment train.

The treated effluent is contained in verification tanks where the effluent is sampled to confirm that the effluent meets the delisting criteria. Under 40 CFR 261, Appendix IX, Table 2, the treated effluent from 200 Area ETF is considered a delisted waste; that is, the treated effluent is no longer a listed dangerous waste subject to the hazardous waste management requirements of RCRA provided that the delisting criteria are satisfied and the treated effluent does not exhibit a dangerous characteristic. The treated effluent is discharged under the Washington State Waste Discharge Permit (No. ST 4500) as a nondangerous, delisted waste to the SALDS, located in the 600 Area, north of the 200 West Area. A portion of the treated wastewater from the Verification Tanks is recycled as service water throughout the facility; for example, it is used to dilute bulk acid and caustic to meet processing needs, thereby reducing the demand for process water.

### B.1.2 Sources of Aqueous Waste

200 Area ETF was intended and designed to treat a variety of mixed wastes. However, process condensate from the 242-A Evaporator was the only mixed waste initially identified for storage and treatment in the LERF and 200 Area ETF. As cleanup activities at Hanford progress, many of the aqueous wastes generated from site remediation and waste management activities are sent to the LERF and 200 Area ETF for treatment and storage. A brief discussion of waste streams that may be managed by LERF and 200 Area ETF in the future may be found in the 200 Area ETF Delisting Petition (DOE/RL-92-97). Prior to management of any new waste streams, it may be necessary to modify this WAP through the permit modification process to ensure that adequate knowledge of such new waste streams is available prior to management of them in LERF and 200 Area ETF.

The 242-A process condensate is a dangerous waste because it is derived from a listed, dangerous waste stored in the Double-Shell Tank (DST) System. The DST waste is transferred to the 242-A Evaporator where the waste is concentrated through an evaporation process. The concentrated slurry waste is returned to the DST System, and the evaporated portion of the waste is recondensed, collected, and transferred as process condensate to the LERF.

Other aqueous wastes that are treated and stored at the LERF and 200 Area ETF include, but are not limited to the following Hanford wastes:

- Contaminated groundwater from pump-and-treat remediation activities such as groundwater from the 200-UP-1 Operable Unit;
- Purgewater from groundwater monitoring activities;
- Water from deactivation activities, such as water from the spent fuel storage basins at deactivated reactors (e.g., N Reactor);
- Laboratory aqueous waste from unused samples and sample analyses;
- Leachate from landfills, such as the Environmental Restoration Disposal Facility;
- Any dilute waste, which may be accepted for treatment and within the scope of wastewaters that maybe delisted under terms of the revised delisting (40 CFR 261, Appendix IX, Table 2).

Most of these aqueous wastes are accumulated in batches in a LERF basin for interim storage and treatment through pH and flow equalization before final treatment in 200 Area ETF. However, some aqueous wastes, such as 200-UP-1 Groundwater, maybe treated on a flow through basis in LERF en route to 200 Area ETF for final treatment. The constituents in these aqueous wastes are common to the Hanford Site and were considered in pilot plant testing or in vendor tests, either as a constituent or as a family of constituents. According to the 200 Area ETF Delisting, Permit Condition 1.a.i, all wastes accepted for treatment at 200 Area ETF must be within a specified treatability envelope that ensures that wastes will be within the treatment capability of 200 Area ETF.

## B.2 Influent Waste Acceptance Process

Throughout the acceptance process, there are specific criteria required for an influent waste (i.e., aqueous waste) to be accepted at the LERF and/or 200 Area ETF. These criteria are identified in the following sections and summarized in Table B.2. The process of accepting a waste into the LERF and 200 Area ETF systems involves a series of steps, as follows.

- Waste information: The generator of an aqueous waste works with LERF and 200 Area ETF personnel to provide characterization data of the waste stream (Section B.2.1).
- Waste management decision process: LERF and 200 Area ETF management decision is based on a case-by-case evaluation of whether an aqueous waste stream is acceptable for treatment or storage at LERF and the 200 Area ETF. The evaluation has two categories:
  - Regulatory acceptability: a review to determine if there are any, regulatory concerns that would prohibit the storage or treatment of an aqueous waste in the LERF or 200 Area ETF; e.g., treatment would meet permit conditions that would comply with applicable regulations.
  - Operational acceptability: an evaluation to determine if there are any operational concerns that would prohibit the storage or treatment of an aqueous waste in the LERF or 200 Area ETF and storage of treatment residuals; e.g., determine treatability and compatibility or safety considerations (Section B.2.2.2).

### B.2.1 Waste Information

When an aqueous waste stream is identified for treatment or storage in the LERF or 200 Area ETF, the generator is required to characterize the waste stream according to the requirements in Section B.2.1.1 and document the results of characterization on an aqueous waste profile sheet. This requirement is the first waste acceptance criterion. The LERF and 200 Area ETF personnel work with the generators to ensure that the necessary information is collected for the characterization of a waste stream (i.e., the appropriate analyses or adequate knowledge), and that the information provided on the waste profile sheet is complete. The completed waste profile sheet is maintained in the Hanford Facility Operating Record, LERF and 200 Area ETF File according to Permit Condition II.I.1.j.

#### B.2.1.1 Waste Characterization

Because the constituents in the individual aqueous waste streams vary, each waste stream is characterized and evaluated for acceptability on a case-by-case basis. The generator is required to designate an aqueous waste, which generally will be based on analytical data. However, a generator may use knowledge to substantiate the waste designation, or for general characterization information. Examples of acceptable knowledge include the following:

- Documented data or information on processes similar to that which generated the aqueous waste stream
- Information/documentation that the waste stream is from specific, well documented processes, e.g., F-listed wastes
- Information/documentation that sampling/analyzing a waste stream would pose health and safety risks to personnel
- Information/documentation that the waste stream does not lend itself to collecting a laboratory sample for example, wastewater collected (e.g., sump, tank) where the source water characterization is documented. Typically, these circumstances occur at decommissioned buildings or locations, not at operating units.

When a generator performs characterization of a dangerous and/or mixed waste stream based on knowledge, LERF and 200 Area ETF personnel review the knowledge as part of the waste acceptance process to ensure the knowledge satisfies the definition of *knowledge* in WAC 173-303-040. Specifically, LERF and 200 Area ETF personnel review the generator's processes to verify the integrity of the knowledge, and determine whether the knowledge is current and consistent with requirements of this is WAP. LERF and 200 Area ETF management or their designee determines the final decision on the adequacy of the knowledge. The persons reviewing generator process knowledge and those making decisions on the adequacy of knowledge are trained according to the requirements of Addendum G, Personnel Training.

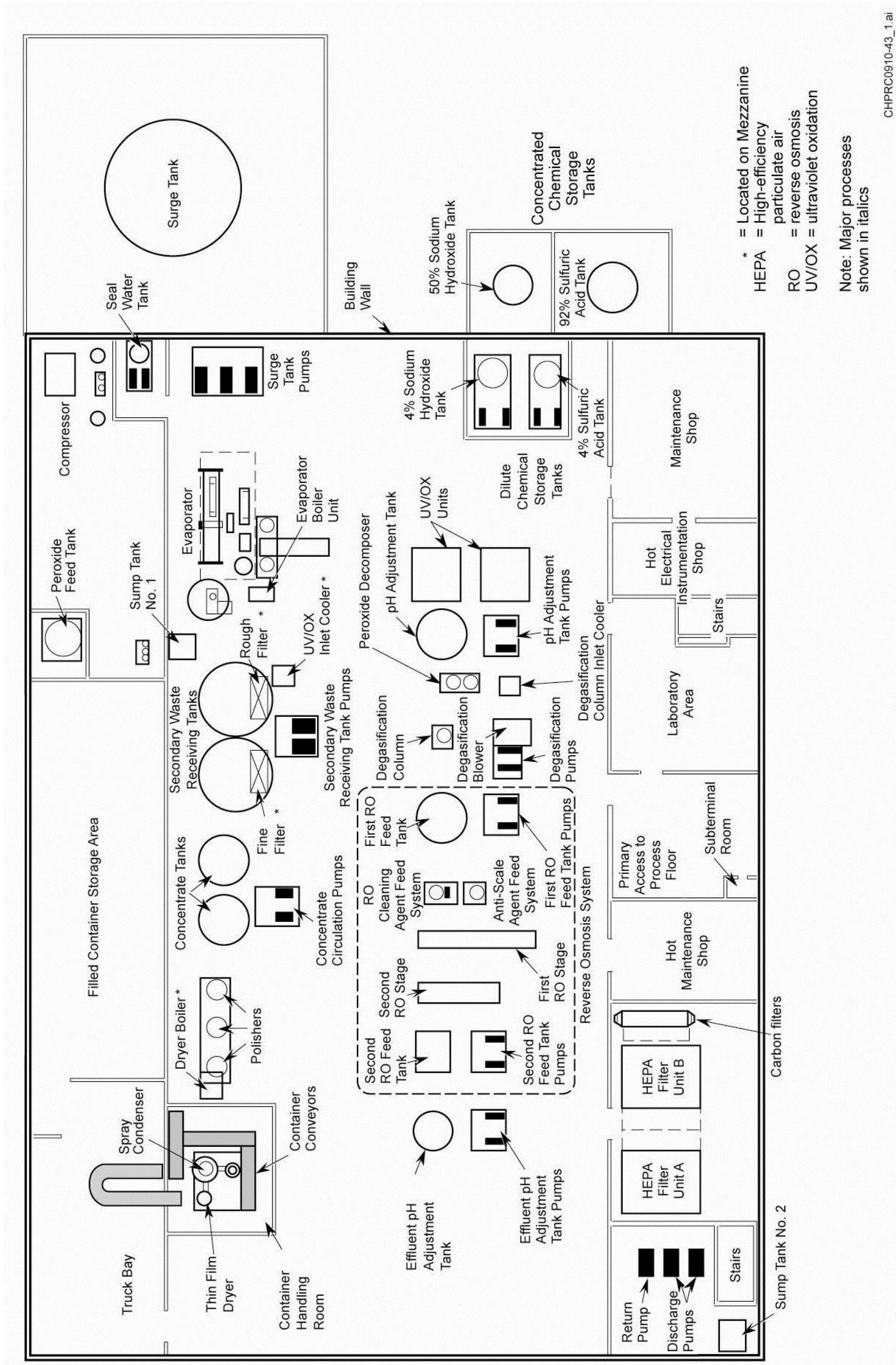


**Figure B.1. 200 Area Effluent Treatment Facility Floor Plan**

The generator is also responsible for identifying Land Disposal Restrictions (LDRs) treatment standards applicable to the influent aqueous waste as part of the characterization, as required under 40 CFR 268.40 incorporated by reference by WAC 173-303-140. Because the 200 Area ETF main treatment train is a Clean Water Act, equivalent treatment unit [40 CFR 268.37(a)] incorporated by reference by WAC 173-303-140, generators are not required to identify underlying hazardous constituents for characteristic wastes pursuant to 40 CFR 268.9, incorporated by reference by WAC 173-303-140, for wastewaters (i.e., <1 percent total suspended solids and <1 percent total organic carbon). The 200 Area ETF secondary waste (e.g., powder) reflects a change in LDR treatability group (i.e., wastewater to non-wastewater) so there is a new LDR point of generation, at which point any characteristic and associated underlying hazardous constituents must be identified. Therefore, generators of a non-wastewater may be required to identify underlying hazardous constituents for characteristic wastes pursuant to 40 CFR 268.9, incorporated by reference by WAC 173-303-140.

When analyzing an aqueous waste stream for LERF and 200 Area ETF waste acceptance characterization, a generator is required to use the target list of parameters identified in Table B.3, of this WAP. This requirement is in addition to any analysis required for purposes of designation under WAC 173-303-070. These data are used by LERF and 200 Area ETF to verify the treatability of an aqueous waste stream, and to develop a treatment plan for the waste after acceptance. Refer to Table B.6, for the corresponding analytical methods. The generator may use knowledge in lieu of some analyses, as determined by LERF and 200 Area ETF management or their designee, if the knowledge satisfies the definition of *knowledge* in WAC 173-303-040. For example if a generator provides information that the process generating an aqueous waste does not include or involve organic chemicals, analyses for organic compounds likely would not be required. Additional analyses could be required if historical information and/or knowledge indicate that an aqueous waste contains constituents not included in the target list of parameters.

The characterization and historical information are documented in the waste profile sheet, which is discussed in the following section and is part of the Hanford Facility Operating Record, LERF and 200 Area ETF File according to Permit Condition II.I.

### B.2.1.2 Aqueous Waste Profile Sheet

The waste profile sheet documents the characterization of each new aqueous waste stream. The profile includes a detailed description of the source, volume, waste designation and applicable LDR treatment standards, and physical nature (wastewater or non-wastewater) of the aqueous waste. For an aqueous waste to be accepted for treatment or storage in the LERF or 200 Area ETF, each new waste stream generator is required to complete and provide this form to LERF and 200 Area ETF management. Each generator also is required to provide the analytical data and/or knowledge used to designate the aqueous waste stream according to WAC 173-303-070 and to determine the chemical and physical nature of the waste.

The LERF and ETF management determine whether the information on the waste profile sheet is sufficient according to the criteria above. The LERF and 200 Area ETF management use this information to evaluate the acceptability of the aqueous waste stream for storage and treatment in the LERF and 200 Area ETF, and to determine if the secondary waste generated from treatment is acceptable for storage at the 200 Area ETF and has a defined path forward to final disposal.

### B.2.2 Waste Management Decision Process

All aqueous waste under consideration for acceptance must be characterized using analytical data and/or knowledge. This information is used to determine the acceptability of an aqueous waste stream. The LERF and 200 Area ETF Facility Manager or their designee is responsible for making the decision to accept or reject an aqueous waste stream. The management decision to accept any aqueous waste stream is based on an evaluation of regulatory acceptability and operational acceptability. Each evaluation uses acceptance criteria, which were developed to ensure that an aqueous waste is managed in a safe, environmentally sound, and in compliance with this Permit. The following sections provide detail on the acceptance evaluation and the acceptance criteria.

An aqueous waste stream could be rejected for one of the following reasons:

- The paperwork and/or laboratory analyses from the generator are insufficient
- Discrepancies with the regulatory and operational acceptance criteria cannot be reconciled, including:
  - An aqueous waste is not allowed under the current Washington State Waste Discharge Permit (No. ST 4500) or 200 Area ETF Delisting, and LERF and 200 Area ETF management elect not to pursue an amendment, or the Permit and Delisting cannot be amended (Section B.2.2.1)
  - An aqueous waste is incompatible with LERF liner materials or with other aqueous waste in LERF and no other management method is available (Section B.2.2.2.2).
- Adequate storage or treatment capacity is not available.

### B.2.2.1 Regulatory Acceptability

Each aqueous waste stream is evaluated on a case-by-case basis to determine if there are any regulatory concerns that would preclude the storage or treatment of a waste in the LERF or 200 Area ETF based on the criteria in Sections B2.2.1.1 and B.2.2.1.2. Before an aqueous waste can be stored or treated in either the LERF or 200 Area ETF, the waste designation must be determined. Information on the waste designation of an aqueous waste is documented in the waste profile sheet. This information is used to confirm that treating or storing the aqueous waste in the LERF or 200 Area ETF is allowed under and in compliance with WAC 173-303, Permit (WA7890008967), 200 Area ETF Delisting in 40 CFR 261, Appendix IX, Table 2, the corresponding State-Issued Delisting, and the Washington State Waste Discharge Permit (No. ST 4500) for 200 Area ETF.

#### B.2.2.1.1 Dangerous Waste Regulations, State and Federal Delisting Actions, and Permits

Before an aqueous waste stream is sent to the LERF or 200 Area ETF, the generator will characterize and designate the stream with the appropriate dangerous/hazardous waste numbers according to WAC 173-303-070. Addendum A, the 200 Area ETF Delisting and the corresponding State-Issued Delisting identify the specific waste numbers for dangerous/mixed waste that can be managed in the LERF and 200 Area ETF. Dangerous waste designated with waste numbers not specified in these documents cannot be treated or stored in the LERF or 200 Area ETF, unless the documents are appropriately modified.

Additionally, aqueous wastes designated with listed waste numbers identified in the 200 Area ETF Delisting and the corresponding State-Issued Delisting will be managed in accordance with the conditions of the delisting, or an amended delisting.

#### B.2.2.1.2 State Waste Permit Regulations/Permit

Compliance with the Washington State Waste Discharge Permit (No. ST 4500), constitutes another waste acceptance criterion. In accordance with the permit conditions of the Washington State Waste Discharge Permit (No. ST 4500), the constituents of concern in each new aqueous waste stream must be identified. The waste designation and characterization data provided by the generator are used to identify these constituents. The Washington State Waste Discharge Permit (No. ST 4500), defines a constituent of concern in an aqueous waste stream, under the conditions of the Discharge Permit, as any contaminant with a maximum concentration greater than one of the following:

- Any limit in the Washington State Waste Discharge Permit (No. ST 4500)
- Groundwater Quality Criteria (WAC 173-200)
- Final Delisting level (40 CFR 261, Appendix IX, Table 2)
- The corresponding State-Issued Delisting

- Background groundwater concentration as measured at the SALDS disposal site. The practical quantification limit (PQL) is used for the groundwater background concentration for constituents not analyzed or not detected in the SALDs background data.

The Permit conditions of the Washington State Waste Discharge Permit (No. ST 4500), also require a demonstration that 200 Area ETF can treat the constituents of concern to below discharge limits.

### B.2.2.2 Operational Acceptability

Because the operating configuration or operating parameters at the LERF and 200 Area ETF can be adjusted or modified, most aqueous waste streams generated on the Hanford Site can be effectively treated to below Delisting and Discharge Permit limits. Because of this flexibility, it would be impractical to define numerical acceptance or decision limits. Such limits would constrain the acceptance of appropriate aqueous waste streams for treatment at the LERF and 200 Area ETF. The versatility of the LERF and 200 Area ETF is better explained in the following examples:

- The typical operating configuration of 200 Area ETF is to process an aqueous waste through the UV/OX unit first, followed by the RO unit. However, high concentrations of nitrates may interfere with the performance of the UV/OX. In this case, 200 Area ETF could be configured to process the waste in the RO unit prior to the UV/OX unit.
- For a small volume aqueous waste with high concentrations of some anions and metals, the approach may be to first process the waste stream in the secondary treatment train. This approach would prevent premature fouling or scaling of the RO unit. The liquid portion (i.e., untreated overheads from 200 Area ETF evaporator and thin film dryer) would be sent to the primary treatment train.
- An aqueous waste with high concentrations of chlorides and fluorides may cause corrosion problems when concentrated in the secondary treatment train. One approach is to adjust the corrosion control measures in the secondary treatment train. An alternative may be to blend this aqueous waste in a LERF basin with another aqueous waste, which has sufficient dissolved solids, such that the concentration of the chlorides in the secondary treatment train would not pose a corrosion concern.
- Some metal salts (e.g., barium sulfate) tend to scale the RO membranes. In this situation, descalants used in the treatment process may be increased.
- Any effluent that does not meet these limits in one pass through 200 Area ETF treatment process is recycled to 200 Area ETF for re-processing.

There are some aqueous wastes, whose chemical and physical properties preclude that waste from being treated or stored at the LERF or 200 Area ETF. Accordingly, an aqueous waste is evaluated to determine if it is treatable, if it would impair the efficiency or integrity of the LERF or 200 Area ETF, and if it is compatible with materials in these units. This evaluation also determines if the aqueous waste is compatible with other aqueous wastes managed in the LERF.

The waste acceptance criteria in this category focus on determining treatability of an aqueous waste stream, and on determining any operational concerns that would prohibit the storage or treatment of an aqueous waste stream in the LERF or 200 Area ETF. The chemical and physical properties of an aqueous waste stream are determined as part of the waste characterization, and are documented on the waste profile sheet and compared to the design of the units to determine whether an aqueous waste stream is appropriate for storage and treatment in the LERF and 200 Area ETF. All decisions and supporting rationale and data will be documented in the Hanford Facility Operating Record, LERF and 200 Area ETF File according to Permit Condition II.I.

### B.2.2.3 Special Requirements Pertaining to Land Disposal Restrictions

Containers of 200 Area ETF secondary waste are transferred to a storage or final disposal unit, as appropriate (e.g., the Central Waste Complex or to the Environmental Restoration Disposal Facility).

200 Area ETF personnel provide the analytical characterization data and necessary process knowledge for the waste to be managed by the receiving staff, and the appropriate LDR documentation.

The following information on the secondary waste is included on the LDR documentation provided to the receiving unit:

- Dangerous waste numbers (as applicable)
- Determination on whether the waste is restricted from land disposal according to the requirements of 40 CFR 268 incorporated by reference by WAC 173-303-140 (i.e., the LDR status of the waste)

The waste tracking information associated with the transfer of waste

- Waste analysis results.

Generally, the operating parameters or operating configuration at the LERF or 200 Area ETF can be adjusted or modified to accommodate these properties. However, in those cases where a treatment process or operating configuration cannot be modified, the aqueous waste stream will be excluded from treatment or storage at the LERF or 200 Area ETF. Additionally, an aqueous waste stream is evaluated for the potential to deposit solids in a LERF basin (i.e., whether an aqueous waste contains sludge or could precipitate solids). This evaluation will also consider whether the blending or mixing of two or more aqueous waste streams will result in the formation of a precipitate. However, because the waste streams managed in the LERF and 200 Area ETF are generally dilute, the potential for mixing waste streams and forming a precipitate is low; no specific compatibility tests are performed. Filtration at the waste source could be required before acceptance into LERF. Waste streams with the potential to form precipitates in LERF or that cannot be blended with other waste streams to avoid precipitate formation are not accepted for treatment at LERF and 200 Area ETF. The Load-in Facility has the ability to perform filtration on incoming waste streams going to both the LERF and 200 Area ETF Load in. See additional discussions of precipitate formation and compliance with LDR requirements in Section B.3. Similar filtration requirements could apply to aqueous waste fed directly to 200 Area ETF without interim treatment in LERF.

To determine if an aqueous waste meets the criterion of treatability, specific information is required. Treatability of a waste stream is evaluated from characterization data provided by the generator as verified through the waste acceptance process, the 200 Area waste acceptance criteria, and the treatability envelope for the 200 Area ETF as documented in Tables C.1 and C.2 of the November 29, 2001 delisting petition. Generators will also provide characterization data to identify those physical and chemical properties that would interfere with, or foul 200 Area ETF treatment process in consultation with LERF and 200 Area ETF representatives. In some instances, knowledge that meets the definition of *knowledge* in WAC 173-303-040 is used for purposes of identifying a chemical or physical property that would be of concern. For example, the generator could provide knowledge that the stream has two phases (an oily phase and an aqueous phase). In this case, if the generator could not physically separate the two phases, the aqueous waste stream would be rejected because the oily phase could compromise some of the treatment equipment. Typically, analyses for the following parameters are required to evaluate treatability and operational concerns:

- total dissolved solids
- total organic carbon
- total suspended solids
- specific conductivity
- pH
- alkalinity
- ammonia
- barium
- calcium
- chloride
- fluoride
- iron
- magnesium
- nitrate
- nitrite
- phosphate
- potassium
- silicon
- sodium
- sulfate

These constituents are identified in Table B.2, which is the list of target analytes used for waste characterization and waste acceptance evaluation.

#### B.2.2.3.1 Compatibility

**Corrosion Control.** Because of the materials of construction used in 200 Area ETF, corrosion is generally not a concern with new aqueous waste streams. Additionally, these waste streams are managed in a manner that minimizes corrosion. To ensure that a waste will not compromise the integrity of 200 Area ETF tanks and process equipment, each waste stream is assessed for its corrosion potential as part of the compatibility evaluation. This assessment usually focuses on chloride and fluoride concentrations; however, the chemistry of each new waste also is evaluated for other parameters that could cause corrosion.

**Compatibility with Liquid Effluent Retention Facility Liner and Piping.** As part of the acceptance process, the criteria of compatibility with the LERF liner materials are evaluated for each aqueous waste stream. This evaluation is performed using knowledge (as defined by WAC 173-303-040) of constituent concentrations in the aqueous waste stream or using constituent concentrations obtained by analyzing the waste stream for the constituents identified in Table B.1 using the analytical methods for these constituents in Section B.9. Then, the constituent concentrations in the waste stream are compared to the decision criteria in Table B.1. If all constituent concentrations are below the decision criteria, then the waste stream is considered compatible with the LERF liner and may be accepted for treatment. Otherwise, the waste stream is considered incompatible with the LERF liner, and it cannot be accepted for treatment in the LERF basins. However, a waste stream may still be acceptable for treatment in ETF if it is fed directly to ETF, bypassing the LERF Basins. Results of this evaluation are documented in the Hanford Facility Operating Record, LERF and 200 Area ETF File according to Permit Condition II.I. The rational for establishing the liner compatibility constituents and decision criteria in Table B.1 is as follows: The high-density polyethylene liners in the LERF basins potentially are vulnerable to the presence of certain constituents that might be present in some aqueous waste. Using EPA SW-846, Method 9090, the liner materials were tested to evaluate compatibility between aqueous waste stored in the LERF and synthetic liner components. Based on the data from the compatibility test and vendor data on the liner materials, several constituents and parameters were identified as potentially harmful (at high concentrations) to the integrity of the liners. From these data and the application of safety factors, concentration limits in Table B.1 were established.

The strategy for protecting the integrity of a LERF liner is to establish upfront that an aqueous waste is compatible before the waste is accepted into LERF. Characterization data on each new aqueous waste stream are compared to the limits outlined in Table B.1 to ensure compatibility with the LERF liner material before acceptance into the LERF.

Before a waste stream is processed at the 242-A Evaporator, the generator reviews DST analytical data and a process condensate profile is developed to ensure the process condensate is compatible with the LERF liner. For flow through aqueous wastes like the 200-UP-1 Groundwater, characterization data will be obtained and reviewed every two years to ensure that liner compatibility is maintained.

In some instances, knowledge may be adequate to determine that an aqueous waste is compatible with the LERF liner. When knowledge is used, it must satisfy the definition of *knowledge* in WAC 173-303-040.

In those instances where knowledge is adequate, the waste characterization would likely not require analysis for these parameters and constituents. Storm water is an example where knowledge is adequate to determine that this aqueous waste is compatible with the LERF liner.

**Compatibility with Other Waste.** Some aqueous wastes, especially small volume streams, are accumulated in the LERF with other aqueous waste. Before acceptance into the LERF, the aqueous waste stream is evaluated for its compatibility with the resident aqueous waste(s). The evaluation focuses on the potential for an aqueous waste to react with another waste (40 CFR 264, Appendix V, *Examples of Potentially Incompatible Wastes*) including formation of any precipitate in the LERF basins. However, the potential for problems associated with commingling aqueous wastes is very low due to the dilute nature of the wastes; this evaluation confirms the compatibility of two or more aqueous wastes from different sources. Compatibility is determined by evaluating parameters such as pH, ammonia, and chloride. No specific analytical test for compatibility is performed.

If it is determined that an aqueous waste stream is incompatible with other aqueous waste streams, alternate management scenarios are available. For example, another LERF basin that contains a compatible aqueous waste(s) might be used, or the aqueous waste stream might be fed directly into 200 Area ETF for treatment. In any case, potentially incompatible waste streams are not mixed, and all aqueous waste is managed in a way that precludes a reaction, degradation of the liner, or interference with 200 Area ETF treatment process.

### B.2.3 Periodic Review Process

In accordance with WAC 173-303-300(4)(a), an influent aqueous waste will be periodically reviewed as necessary to ensure that the characterization is accurate and current. At a minimum, an aqueous waste stream will be reviewed in the following situations.

- The LERF and 200 Area ETF management have been notified, or have reason to believe that the process generating the waste has changed.
- The LERF and 200 Area ETF management note an increase or decrease in the concentration of a constituent in an aqueous waste stream, beyond the range of concentrations that was described or predicted in the waste characterization.
- Waste streams will be reviewed every two years

In these situations, LERF and 200 Area ETF management will review the available information. If existing analytical information is not sufficient, the generator may be asked to review and update the current waste characterization, to supply a new WPS, or re-sample and re-analyze the aqueous waste, as necessary. Other situations that might require a re-evaluation of a waste stream are discussed in the following sections.

### B.2.4 Record/Information and Decision

The information and data collected throughout the acceptance process, and the evaluation and decision on whether to accept an influent aqueous waste stream for treatment or storage in the LERF or 200 Area ETF are documented as part of Hanford Facility Operating Record, LERF and 200 Area ETF File pursuant to Permit Condition II.I. Specifically, the Hanford Facility Operating Record, LERF and 200 Area ETF File contains the following components on a new influent aqueous waste stream:

- The signed WPS for each aqueous waste stream and analytical data
- Knowledge used to characterize a dangerous/mixed waste (under WAC 173-303), and information supporting the adequacy of the knowledge
- The evaluation on whether an aqueous waste stream meets the waste acceptance criteria, including:
  - The evaluation for regulatory acceptability including appropriate regulatory approvals
  - The evaluation for LERF liner compatibility and for compatibility with other aqueous waste

## Table B.1. General Limits for Liner Compatibility

| Chemical Family | Constituent(s) or Parameter(s)[1] | Limit (mg/L)[2] (sum of constituent concentrations) |
|---|---|---|
| Alcohol/glycol | 1-butanol | 500,000 |
| Alkanone[3] | acetone, | 200,000 |
| Alkenone[4] | none targeted | N/A |
| Aromatic/cyclic hydrocarbon | acetophenone, benzene, carbozole, chrysene, cresol, di-n-octyl phthalate, diphenylamine, isophorone, pyridine, tetrahydrofuran | 2000 |
| Halogenated hydrocarbon | arochlors, carbon tetrachloride, chloroform, hexachlorobenzene, lindane (gamma-BHC), hexachlorocyclopentadiene, methylene chloride, p-chloroaniline, tetrachloroethylene, 2,4,6-trichlorophenol | 2000 |
| Aliphatic hydrocarbon | none targeted | N/A |
| Ether | dichloroisopropyl ether | 2000 |
| Other hydrocarbons | acetontrile, carbon disulfide, n-nitrosodimethylamine, tributyl phosphate | 2000 |
| Oxidizers | none targeted | NA |
| Acids, Bases, Salts | ammonia, cyanide, anions, cations | 100,000 |
| pH | pH | 0.5 < pH < 13.0 |

[1]Analytical methods for the parameters and constituents are provided in Section B.9
[2]Analytical data are evaluated using the following 'sum of the fraction' technique. The individual constituent concentration is evaluated against the compatibility limit for its chemical family. The sum of the evaluations must be less than 1. pH is not part of this evaluation.

$$\sum_{n=1}^{i}\left(\frac{Conc_n}{LIMIT_n}\right) \leq 1$$

[3]Ketone containing saturated alkyl group(s)
[4]Ketone containing unsaturated alkyl group(s)
Where 'i' is the number of organic constituents detected
mg/L = milligrams per liter
NA = not applicable

**Table B.2. Waste Acceptance Criteria**

| General criteria category | Criteria description |
|---|---|
| 1. Characterization | A. Each generator must provide an aqueous waste profile. |
| | B. Each generator must designate the aqueous waste stream. |
| | C. Each generator must provide analytical data and/or knowledge. |
| 2. Regulatory acceptability | A. The LERF and 200 Area ETF can store and treat influent aqueous wastes with waste numbers identified in Addendum A for the LERF and 200 Area ETF, and the 200 Area ETF Delisting, 40 CFR 261, Appendix IX, Table 2. |
| | B. The aqueous waste must comply with conditions of the Discharge Permit. |
| 3. Operational acceptability | A. Determine whether an aqueous waste stream is treatable, considering:<br>1. Whether the removal and destruction efficiencies on the constituents of concern will be adequate to meet the Discharge Permit and Delisting levels<br>2. Other treatability concerns; analyses for this evaluation may include:<br>total dissolved solids — iron<br>total organic carbon — magnesium<br>total suspended solids — nitrate<br>specific conductivity — nitrite<br>alkalinity — phosphate<br>ammonia — potassium<br>barium — silicon<br>calcium — sodium<br>chloride — sulfate<br>fluoride — pH |
| | B. Determine whether an aqueous waste stream is compatible, considering:<br>1. Whether an aqueous waste stream presents corrosion concerns with respect to ETF; analysis may include chloride and fluoride<br>2. Whether an aqueous waste stream is compatible with LERF liner materials, compare characterization data to the liner compatibility limits (Table B.1).<br>3. Whether an aqueous waste stream is compatible with other aqueous waste(s), 40 CFR 264, Appendix V, comparison will be used. |

## B.3 Special Management Requirements

Special management requirements for aqueous wastes that are managed in the LERF or 200 Area ETF are discussed in the following section.

### B.3.1 Land Disposal Restriction Compliance at Liquid Effluent Retention Facility

Because LERF provides treatment through flow and pH equalization, a surface impoundment treatment exemption from the land disposal restrictions was granted in accordance with 40 CFR 268.4, and WAC 173-303-040. This treatment exemption is subject to several conditions, including a requirement that the WAP address the sampling and analysis of the treatment 'residue' [40 CFR 268.4(a)(2)(i) and WAC 173-303-300(5)(h)(i) and (ii)] to ensure the 'residue' meets applicable treatment standards. Though the term 'residue' is not specifically defined, this condition further requires that sampling must be designed to represent the "sludge and the supernatant" indicating that a residue may have a sludge (solid) and supernatant (liquid) component.

Solid residue is not anticipated to accumulate in a LERF basin for the following reasons:

- Aqueous waste streams containing sludge would not be accepted into LERF under the acceptance criteria of treatability (Section B.2.2.2.1)
- No solid residue was reported from process condensate discharged to LERF in 1995
- The LERF basins are covered and all incoming air first passes through a breather filter
- No precipitating or flocculating chemicals are used in flow and pH equalization.

- Multiple waste streams managed in a single LERF basin are evaluated for the formation of precipitates. Wastes that would form precipitates are not accepted for treatment at LERF.

Therefore, the residue component subject to this condition is the supernatant (liquid component). Additionally, an aqueous waste stream is evaluated for the potential to deposit solids in a LERF basin (i.e., an aqueous waste that contains suspended solids). If necessary, filtration at the waste source could be required before acceptance into LERF. Therefore, the residue component in LERF subject to this condition is the supernatant (liquid component). The contingency for removal of solids will be addressed during closure in Addendum H, Closure Plan.

The conditions of the treatment exemption also require that treatment residues (i.e., aqueous wastes), which do not meet the LDR treatment standards "must be removed at least annually" [40 CFR 268.4(a)(2)(ii) incorporated by reference by WAC 173-303-140]. To address the conditions of this exemption, an influent aqueous waste is sampled and analyzed and the LDR status of the aqueous waste is established as part of the acceptance process. The LERF basins are then managed such that any aqueous waste(s), which exceeds an LDR standard is removed annually from a LERF basin, except for a heel of approximately 1 meter. A heel is required to stabilize the LERF liner. The volume of the heel is approximately 1.9 million liters.

## B.4 Influent Aqueous Waste Sampling and Analysis

The following sections provide a summary of the sampling procedures, frequencies, and analytical parameters for characterization of influent aqueous waste (Section B.2) and in support of the special management requirements for aqueous waste in the LERF (Section B.3).

### B.4.1 Sampling Procedures

With a few exceptions, generators are responsible for the characterization, including sampling and analysis, of an influent aqueous waste. Process condensate is either sampled at the 242-A Evaporator or accumulated in a LERF basin following a 242-A Evaporator campaign and sampled. Other exceptions will be handled on a case-by-case basis and the Hanford Facility Operating Record, LERF and 200 Area ETF File will be maintained at the unit for inspection by Ecology. The following section discusses the sampling locations, methodologies, and frequencies for these aqueous wastes. For samples collected at the LERF and 200 Area ETF, unit-specific sampling protocol is followed. The sample containers, preservation materials, and holding times for each analysis are listed in Section B.9.

#### B.4.1.1 Batch Samples

In those cases where an aqueous waste is sampled in a LERF basin, samples are collected from four of the six available sample risers located in each basin, i.e., four separate samples. When LERF levels are low, fewer than four samples can be taken if the sampling approach is still representative. Though there are eight sample risers at each basin, one is dedicated to liquid level instrumentation and another is dedicated as an influent port. Operating experience indicates that four samples adequately capture the spatial variability of an aqueous waste stream in the LERF basin. Specifically, sections of stainless steel (or other compatible material) tubing are inserted into the sample riser to an appropriate depth. Using a portable pump, the sample line is flushed with the aqueous waste and the sample collected. The grab sample containers typically are filled for volatile organic compounds (VOC) analysis first, followed by the remainder of the containers for the other parameters.

Several sample ports are also located at 200 Area ETF, including a valve on the recirculation line at 200 Area ETF surge tank, and a sample valve on a tank discharge pump line at 200 Area ETF Load-in Station. All samples are obtained at the LERF or 200 Area ETF are collected in a manner consistent with SW-846 procedures (EPA as amended).

### B.4.2 Analytical Rationale

As stated previously, each generator is responsible for designating and characterizing an aqueous waste stream. Accordingly, each generator samples and analyzes an influent waste stream using the target list of parameters (Table B.3) for the waste acceptance process. At the discretion of the LERF and ETF management, a generator may provide knowledge in lieu of some analyses as discussed in Section B.2.1.1. The LERF and ETF personnel will work with the generator to determine which parameters are appropriate for the characterization.

The analytical methods for these parameters are provided in Section B.9. All methods are EPA methods satisfying the requirements of WAC 173-303-110(3). Additional analyses may be required if historical information and knowledge indicate that an influent aqueous waste contains constituents not included in the target list of parameters. For example, if knowledge indicates that an aqueous waste contains a parameter that is regulated by the Groundwater Quality Criteria (WAC 173-200), that parameter(s) would be added to the suite of analyses required for that aqueous waste stream.

The analytical data for the parameters presented in Table B.3, including VOC, SVOC, metals, anions, and general chemistry parameters are used to define the physical and chemical properties of the aqueous waste for the following:

- Set operating conditions in the LERF and ETF (e.g., to determine operating configuration , refer to Section B.2.2.2)
- Identify concentrations of some constituents which may also interfere with, or foul ETF treatment process (e.g., fouling of the RO membranes, refer to Section B.2.2.2)
- Evaluate LERF liner and piping material compatibility
- Determine treatability to evaluate if applicable constituents in the treated effluent will meet Discharge Permit and Delisting limits
- Estimate concentrations of some constituents in the waste generated in the secondary treatment train (i.e., dry powder waste).

**Table B.3. Target Parameters for Influent Aqueous Waste Analyses**

| VOLATILE ORGANIC COMPOUNDS | SEMIVOLATILE ORGANIC COMPOUNDS |
|---|---|
| Acetone<br>Acetonitrile<br>Benzene<br>1-Butanol<br>Carbon disulfide<br>Carbon tetrachloride<br>Chloroform<br>Methylenechloride<br>Tetrachloroethylene<br>Tetrahydrofuran | Acetophenone<br>Cresol (o, p, m)<br>Dichloroisopropyl ether (bis(2-chloropropyl)ether)<br>Di-n-octyl phthalate<br>Diphenylamine<br>Hexachlorobenzene<br>Hexachlorocyclopentadiene<br>Iosophorone<br>Lindane (gamma-BHC)<br>N-nitrosodimethylamine<br>Pyridine<br>Tributyl phosphate<br>2,4,6-Trichlorophenol |
| **TOTAL METALS** | **ANIONS** |
| Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc | Chloride<br>Fluoride<br>Nitrate<br>Nitrite<br>Phosphate<br>Sulfate |
| | **GENERAL CHEMISTRY PARAMETERS** |
| | Ammonia<br>Cyanide<br>pH<br>Total suspended solids<br>Total dissolved solids<br>Total organic carbon<br>Specific conductivity |

## B.5 Treated Effluent Sampling and Analysis

The treated aqueous waste, or effluent, from 200 Area ETF is collected in three 2,940,000-liter verification tanks before discharge to the SALDS. To determine whether the Discharge Permit early warning values, enforcement limits, and the Delisting criteria are met, the effluent routinely is sampled at the verification tanks. The sampling and analyses performed are described in the following sections.

### B.5.1 Rationale for Effluent Analysis Parameter Selection

The parameters measured in the treated effluent are required by the following regulatory documents:

- Delisting criteria from the 200 Area ETF Delisting (40 CFR 261, Appendix IX, Table 2)
- Corresponding State Final Delisting issued pursuant to WAC 173-303-910(3)
- Effluent limits from the Washington State Waste Discharge Permit (No. ST 4500)
- Early warning values from the Washington State Waste Discharge Permit (No. ST 4500)

The 200 Area ETF Delisting provides two testing regimes for the treated effluent. Initial verification testing is performed when a new influent waste stream is processed through the 200 Area ETF. For each 200 Area ETF influent waste stream, the first generated verification tank must be sampled and analyzed for all delisting constituents and conductivity. Subsequent verification sampling and analysis of all delisting parameters is performed on every 15$^{th}$ tank of that 200 Area ETF influent waste stream. If the concentration of any analyte is found to exceed a Washington State Waste Discharge Permit (No. ST 4500), enforcement limit or a Delisting criterion, the contents of the verification tank are reprocessed and/or re-analyzed. The next verification tank generated is also sampled for all delisting constituents. If the concentration of any analyte exceeds an early warning value, an early warning value report is prepared and submitted to Ecology.

### B.5.2 Effluent Sampling Strategy: Methods, Location, Analyses, and Frequency

Effluent sampling methods and locations, the analyses performed, and frequency of sampling are discussed in the following sections.

#### B.5.2.1 Effluent Sampling Method and Location

Samples of treated effluent are collected and analyzed to verify the treatment process using 200 Area ETF specific sampling protocol. These verification samples are collected at a sampling port on the verification tank recirculation line. Section B.9 presents the sample containers, preservatives, and holding times for each parameter monitored in the effluent.

#### B.5.2.2 Analyses of Effluent

The parameters required by the current Washington State Waste Discharge Permit (No. ST 4500), and Final Delisting 200 Area ETF, conditions are presented in Table B.4. The analytical methods and PQLs associated with each parameter are provided in Section B.9. The methods and PQLs are equivalent to those used in the analysis of influent aqueous waste.

#### B.5.2.3 Frequency of Sampling

Treated effluent is tested for all parameters listed in Table B.4 on a frequency satisfying the permit conditions of the Washington State Waste Discharge Permit (No. ST 4500), and the 200 Area ETF Delisting. This effluent must meet the Washington State Waste Discharge Permit (No. ST 4500), and 200 Area ETF Delisting limits associated with these parameters. Grab samples are collected from each verification tank.

During operation of 200 Area ETF, if one or more of the constituents exceeds a Delisting criterion, the Delisting conditions require:

- The characterization data and processing strategy of the influent waste stream be reviewed and changed accordingly to ensure the contents of subsequent tanks do not exceed the Delisting criteria
- The contents of the verification tank are recycled for additional treatment. The contents that are recycled are resampled after treatment to ensure no constituents exceed a Delisting criteria
- The contents of the following verification tank are sampled for compliance with the Delisting criteria.
- Treated effluent that does not meet Washington State Waste Discharge Permit (No. ST 4500) is not discharged to the SALDS until the tank has been retreated and/or reanalyzed.

### B.6 Effluent Treatment Facility Generated Waste Sampling and Analysis

The wastes discussed in this section include the wastes generated at 200 Area ETF and are managed in the container storage areas of 200 Area ETF. This section describes the characterization of the following secondary waste streams generated within 200 Area ETF:

- Secondary waste generated from the treatment process, including the following waste forms:
  - dry powder waste
  - concentrate tanks slurry
  - sludge removed from process tanks
- Waste generated by operations and maintenance activities
- Miscellaneous waste generated within 200 Area ETF.

For each waste stream described, a characterization methodology and rationale are provided, and sampling requirements are addressed.

### B.6.1 Secondary Waste Generated from Treatment Processes

The following terms used in this Section, including powder, dry powder, waste powder, and dry waste powder, are equivalent to the term 'dry powder waste'.

A dry powder waste is generated from the secondary treatment train, from the treatment of an aqueous waste. Waste is received in the secondary treatment train in waste receiving tanks where it is fed into an evaporator. Concentrate waste from the evaporator is then fed to a concentrate tank. From these tanks, the waste is fed to a thin film dryer and dried into a powder, and collected into containers. The containers are filled via a remotely controlled system. The condensed overheads from the evaporator and thin film dryer are returned to the surge tank to be fed to the primary treatment train.

Occasionally, salts from the treatment process (e.g., calcium sulfate and magnesium hydroxide) accumulate in process tanks as sludge. Because processing these salts could cause fouling in the thin film dryer, and to allow uninterrupted operation of the treatment process, the sludge is removed and placed in containers. The sludge is dewatered and the supernate is pumped back to 200 Area ETF for treatment.

The secondary treatment system typically receives and processes the following by-products generated from the primary treatment train:

- Concentrate from the first RO stage
- Backwash from the rough and fine filters
- Regeneration waste from the ion exchange system
- Spillage or overflow collected in the process sumps.

In an alternate operating scenario, some aqueous wastes may be fed to the secondary treatment train before the primary treatment train.

#### B.6.1.1 Special Requirements Pertaining to Land Disposal Restrictions

Containers of 200 Area ETF secondary waste are transferred to a storage or final disposal unit, as appropriate (e.g., the Central Waste Complex or to the Environmental Restoration Disposal Facility). 200 Area ETF personnel provide the analytical characterization data and necessary knowledge for the waste to be managed by the receiving staff, and for the appropriate LDR documentation.

The following information on the secondary waste is included on the LDR documentation provided to the receiving unit:

- Dangerous waste numbers (as applicable)
- Determination on whether the waste is restricted from land disposal according to the requirements of 40 CFR 268 incorporated by reference by WAC 173-303-140 (i.e., the LDR status of the waste)

The waste tracking information associated with the transfer of waste

- Waste analysis results.

#### B.6.1.2 Sampling Methods

The dry powder waste and containerized sludge are sampled from containers using the principles presented in SW-846 (EPA as amended) and ASTM Methods (American Society for Testing Materials), as referenced in WAC 173-303-110(2). The sample container requirements, sample preservation requirements, and maximum holding times for each of the parameters analyzed in either matrix are presented in Section B.9.

Concentrate tank waste samples are collected from recirculation lines, which provide mixing in the tank during pH adjustment and prevent caking. The protocol for concentrate tank sampling prescribes opening a sample port in the recirculation line to collect samples directly into sample containers. The sample port line is flushed before collecting a grab sample. The VOC sampling typically is performed first for grab samples. Each VOC sample container will be filled such that cavitation at the sample valve is minimized and the container has no headspace. The remainder of the containers for the other parameters will be filled next.

**Table B.4. Rationale for Parameters to be Monitored in Treated Effluent**

| Parameter | (Cas No.) | 200 Area ETF Delisting[1] | Discharge Permit[2] | |
|---|---|---|---|---|
| | | | Enforcement Limit | Early Warning Value |
| VOLATILE ORGANIC COMPOUNDS | | | | |
| Acetone | (67-64-1) | X | | |
| Acetonitrile | (75-05-8) | X | | |
| Benzene | (71-43-2) | X | | X |
| 1-Butanol | (71-36-3) | X | | |
| Carbon disulfide | (75-15-0) | X | | |
| Carbon tetrachloride | (56-23-5) | X | X | |
| Chloroform | (67-66-3) | | | X |
| Methylene Chloride | (75-09-2) | | M | |
| Tetrachloroethylene | (127-18-4) | | X | |
| Tetrahydrofuran | (109-99-9) | X | | X |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | |
| Acetophenone | (98-86-2) | | X | |
| Carbazole | (86-74-8) | X | | |
| p-Chloroaniline | (106-47-8) | X | | |
| Chrysene | (218-01-9) | X | | |
| Cresol (total) | (1319-77-3) | X | | |
| Dichloroisopropyl ether (bis(2-chloroisopropyl)ether) | (108-60-1) | X | | |
| Di-n-octyl phthalate | (117-84-0) | X | | |
| Diphenylamine | (122-39-4) | X | | |
| Hexachlorobenzene | (118-74-1) | X | | |
| Hexachlorocyclopentadiene | (77-47-4) | X | | |
| Isophorone | (78-59-1) | X | | |
| Lindane (gamma-BHC) | (58-89-9) | X | | |
| N-nitrosodimethylamine | (62-75-9) | X | X | |
| Pyridine | (110-86-1) | X | | |
| Tributyl phosphate | (126-73-8) | X | | |
| 2,4,6-Trichlorophenol | (88-06-2) | X | | |
| PCBs | | | | |
| Aroclor 1016 | (12674-11-2) | X | | |
| Aroclor 1221 | (11104-28-2) | X | | |
| Aroclor 1232 | (11141-16-5) | X | | |
| Aroclor 1242 | (53469-21-9) | X | | |
| Aroclor 1248 | (12672-29-6) | X | | |
| Aroclor 1254 | (11097-69-1) | X | | |
| Aroclor 1260 | (11096-82-5) | X | | |
| TOTAL METALS3 | | | | |
| Arsenic | (7440-38-2) | X | X | |
| Barium | (7440-39-3) | X | | |
| Beryllium | (7740-41-7) | X | X | |
| Cadmium | (7440-43-9) | X | | X |
| Chromium | (7440-47-3) | X | X | |

**Table B.4. Rationale for Parameters to be Monitored in Treated Effluent**

| Parameter | (Cas No.) | 200 Area ETF Delisting[1] | Discharge Permit[2] | |
|---|---|---|---|---|
| | | | Enforcement Limit | Early Warning Value |
| Copper | (7440-50-8) | | | X |
| Lead | (7439-92-1) | X | | X |
| Mercury | (7439-97-6) | X | | X |
| Nickel | (7440-02-0) | X | | |
| Selenium | (7782-49-2) | X | | |
| Silver | (7440-22-4) | X | | |
| Vanadium | (7440-62-2) | X | | |
| Zinc | (7440-66-6) | X | | |
| ANIONS | | | | |
| Chloride | (16887-00-6) | | X | |
| Fluoride | (16984-48-8) | X | | |
| Nitrate (as N) | (14797-55-8) | | X | |
| Nitrite (as N) | (1479765-0) | | X | |
| Sulfate | (14808-79-8) | | X | |
| OTHER ANALYSES | | | | |
| Ammonia | (7664-41-7) | X | X | |
| Cyanide | (57-12-5) | X | | |
| Total dissolved solids | | | | X |
| Total organic carbon | | | X | |
| Total suspended solids | | | X | |
| Specific conductivity | | | M | |

[1]Parameters required by the current conditions of the 200 Area ETF Delisting, 40 CFR 261, Appendix IX, Table 2,70 FR 44496 (EPA 2005)
[2]Parameters required by the current conditions of the State Waste Discharge Permit, No. ST 4500
[3]Metals reported as total concentrations
X = Rationale for measuring this parameter in treated effluent
M = Monitor only; no limit defined
PCBs = polychlorinated biphenyls

### B.6.1.3 Sampling Frequency

When designation or identification of applicable LDR treatment standards of the 200 Area ETF secondary waste cannot be based on influent characterization data or knowledge as described in Section B.6.1.1, 200 Area ETF secondary waste is sampled on a batch basis. A batch is defined as any volume of aqueous waste that is being treated under consistent and constant process conditions.

When personnel exposures are of concern, one representative sample will be collected from the concentrate tank, if waste from the concentrate tank. The sample will be analyzed for the appropriate parameters identified in Table B.5 based on the needs identified from evaluating influent waste analysis data. If sampling of the concentrate tank is not technically practicable for purposes of designating the powder, direct sampling of the dry powder will be used to make determinations on the dry powder. The dry powder or concentrate tanks will be resampled in the following situations:

- Change in influent characterization
- Change in process chemistry, as indicated by in-line monitoring of conductivity and pH
- The LERF and 200 Area ETF management have been notified, or have reason to believe that the process generating the waste has changed (for example, a source change such as a change in the well-head for groundwater that significantly changes the aqueous waste characterization).

- The LERF and 200 Area ETF management note an increase or decrease in the concentration of a constituent in an aqueous waste stream, beyond the range of concentrations that was described or predicted in the waste characterization.

### B.6.2 Operations and Maintenance Waste Generated at the 200 Area Effluent Treatment Facility

Operation and maintenance of process and ancillary equipment generates additional routine waste. These waste materials are segregated to ensure proper handling and disposition, and to minimize the commingling of potentially dangerous waste with nondangerous waste. The following waste streams are anticipated to be generated during routine operation and maintenance of 200 Area ETF. This waste might or might not be dangerous waste, depending on the nature of the material and its exposure to a dangerous waste.

- Spent lubricating oils and paint waste from pumps, the dryer rotor, compressors, blowers, and general maintenance activities
- Spent filter media and process filters
- Spent ion exchange resin
- HEPA filters
- UV light tubes
- RO membranes
- Equipment that cannot be returned to service
- Other miscellaneous waste that might contact a dangerous waste (e.g., plastic sheeting, glass, rags, paper, waste solvent, or aerosol cans).

These waste streams are stored at 200 Area ETF before being transferred for final treatment, storage, or disposal as appropriate. This waste is characterized and designated using knowledge (from previously determined influent aqueous waste composition information); analytical data; and material safety data sheets (MSDS) of the chemical products present in the waste or used (the data sheets are maintained at 200 Area ETF). Sampling of these waste streams is not anticipated; however, if an unidentified or unlabeled waste is discovered, that waste is sampled. This 'unknown' waste is sampled and analyzed for the parameters in Table B.5 as appropriate, and will be designated according to Washington state regulatory requirements. The specific analytical methods for these analyses are provided in Section B.9.

### B.6.3 Other Waste Generated at the 200 Area Effluent Treatment Facility

There are two other potential sources of waste at 200 Area ETF: spills and/or overflows, and discarded chemical products. Spills may be subject to the requirements of Permit Condition II.E. Spilled material that potentially might be dangerous waste generally is either containerized or routed to 200 Area ETF sumps where the material is transferred either to the surge tank for treatment or to the secondary treatment train. In most cases, knowledge and the use of MSDSs are sufficient to designate the waste material. If the source of the spilled material is unknown and the material cannot be routed to 200 Area ETF sumps, a sample of the waste is collected and analyzed according to Table B.5, as necessary, for appropriate characterization of the waste. Unknown wastes will be designated according to Washington State regulatory requirements at WAC 173-303-070. The specific analytical methods for these analyses are provided in Section B.9.

A discarded chemical product waste stream could be generated if process chemicals, cleaning agents, or maintenance products become contaminated or are otherwise rendered unusable. In all cases, these materials are appropriately containerized and designated. Sampling is performed, as appropriate, for waste designation.

**Table B.5. 200 Area Effluent Treatment Facility Generated Waste - Sampling and Analysis**

| Parameter[1] | Rationale |
|---|---|
| • Total solids or percent water[2] | • Calculate dry weight concentrations |
| • Volatile organic compounds[3] | • LDR - verify treatment standards |
| • Semivolatile organic compounds[3] | • LDR - verify treatment standards |
| • Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver) | • Waste designation<br>• LDR - verify treatment standards |
| • Cation and anions of concern | • Address receiving TSD unit waste acceptance requirements |
| • pH | • Waste designation |

1 For influent and concentrate tank samples, the total sample (solid plus liquid) is analyzed and the analytical result is expressed on a dry weight basis. The result for toxicity characteristic metal and organic is divided by a factor of 20 and compared to the toxicity characteristic (TC) constituent limits [WAC 173-303-090(8)]. If the TC limit is met or exceeded, the waste is designated accordingly. All measured parameters are compared against the corresponding treatment standards.

2 Total solids or percent water are not determined for unknown waste and dry powder waste samples and are analyzed in maintenance waste and sludge samples, as appropriate ( i.e., percent water might not be required for such routine maintenance waste as aerosol cans, fluorescent tubes, waste oils, batteries, etc., or sludge that has dried).

3 VOC and/or SVOC analysis of secondary waste is required unless influent characterization data and knowledge indicate that the constituent will not be in the final secondary waste at or above the LDR.

LDR = land disposal restrictions
TSD = treatment, storage, and/or disposal

## B.7 Quality Assurance/Quality Control

The following quality assurance/quality control (QA/QC) plan for LERF and 200 Area ETF is provided as required by WAC 173-303-810(6) and follows the guidelines of EPA QA/G-5.

### B.7.1 Project Management

The following sections address project administrative functions and approaches.

#### B.7.1.1.1 Project Organization

Overall management of the LERF/200 Area ETF is performed by the Facility Manager, who is responsible for safe operation of the facility, including implementation of this QA/QC plan and compliance with applicable permits and regulations. The Facility Manager also provides retention of project records in accordance with this plan. Assisting the Facility Manager is an Environmental Field Representative that monitors compliance, reviews new requirements and regulations, and interfaces with EPA and Ecology. Also assisting the Facility Manager is a QA representative who is responsible for implementing the QA program at the facility.

Reporting to the Facility Manager are several support groups. The Operations group consists of trained personnel who operate the plant, including operators performing sampling activities such as collection, packaging, and transportation of samples to the laboratory. The Maintenance group is responsible for performing calibrations and preventative maintenance on facility equipment, including pH, conductivity, and flow meters required by environmental permits. The Engineering group monitors the process with online instruments and sampling for process control. The Engineering group also performs waste acceptance, and environmental compliance activities, including scheduling sampling, generating data forms, and reviewing data.

#### B.7.1.2 Special Training

Individuals involved in sampling, analysis, and data review will be trained and qualified to implement safely the activities addressed in this WAP and QA/QC plan. Training will conform to the training requirements specified in WAC 173-303-330 and the LERF/200 Area ETF Dangerous Waste Training Plan (Addendum F). Training records will be maintained in accordance with Section B.7.1.3 of this WAP.

#### B.7.1.3 Documentation and Records

Sample records are documented as part of the Hanford Facility Operating Record, LERF and 200 Area ETF File pursuant to Permit Condition II.I. These documents and records include the following:

- Training
- Chains of Custody for all regulatory sampling performed by LERF and 200 Area ETF
- Data Summary Reports
- QA/QC reports
- Assessment reports
- Instrument inspection, maintenance, and calibration logs

### B.7.2 Data Quality Parameters and Criteria

Data quality parameters are listed by EPA QA/G-5S, *Guidance for Choosing a Sampling Design for Environmental Data Collection* as:

- Purpose of Data Collection (e.g. determining if a parameter exceeds a threshold level)
- Spatial and Temporal Boundaries of Study
- Preliminary Estimation of Sample Support (volume that each sample represents)
- Statistical Parameter of Interest (e.g. mean, percentile, percentage), and
- Limits on Decision Error/Precision (e.g. false acceptance error, false rejection error)

The parameters for the first four bullets (limits, sample points, frequency of samples, etc.) are already established in the permits, delisting petition, and this WAP. The focus of this QA/QC plan is on limits on decision error/precision.

The data quality parameters were chosen to ensure Limits on Decision Error/Precision are appropriate for purposes of using the data to demonstrate compliance with permits, delisting exclusion limits, and this WAP. The principal quality parameters are precision, accuracy, representativeness, comparability, and completeness. Secondary data parameters of importance include sensitivity and detection levels. The data quality parameters and the data acceptance criteria are discussed below.

#### B.7.2.1 Precision

Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. Precision is expressed in terms of the relative percent difference (RPD) for duplicate measurements. QA/QC sample types that test precision include field and laboratory duplicates and spike duplicates. The RPDs for laboratory duplicates and/or matrix spike duplicates will be routinely calculated.

$$\mathrm{RPD} = (100)\mathit{absolute\ value\ of}\left(\frac{\text{sample result} - \text{duplicate sample result}}{\text{average of sample result} + \text{duplicate sample result}}\right)$$

Matrix spike duplicates are replicates of matrix spike samples that are analyzed with every analytical batch that contains an ETF treated effluent sample. The precision of the analytical methods are estimated from the results of the matrix spike (MS) and the matrix spike duplicate (MSD) for selected analytes. Matrix spike analyses cannot be performed for certain analytical methods, including conductivity, pH, and total dissolved solids. Duplicate analyses are used to determine the RPD for these methods. The precision acceptance criteria are specified in Table B.6.

### B.7.2.2 Accuracy

Accuracy assesses the closeness of the measured value to an accepted reference value. Accuracy of analytical results is typically assessed using matrix spikes. A matrix spike is the addition of a known amount of the analyte to the sample matrix being analyzed. Accuracy is expressed as a percent recovery of the spiked samples.

$$\text{Percent Recovery} = 100\left(\frac{\text{matrix spike sample result} - \text{sample result}}{\text{spiked amount}}\right)$$

Matrix spike analyses cannot be performed on certain analytical methods, including conductivity, pH, and total dissolved solids. The percent recovery for the laboratory control standard samples demonstrates that these methods are working properly and gives an estimate of the method's accuracy. The percent recovery will be routinely calculated.

Accuracy criteria are established to provide confidence that the result is below the action level. Therefore the closer the result is to the action level the higher the degree of accuracy needed. The upper and lower accuracy acceptance criteria are specified in Table B.6. The criteria are reasonable values based on previous analysis of constituents in the delisting exclusion, or similar constituents.

### B.7.2.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent selected characteristics of a parameter at a sampling point or process condition. Because of the matrix being analyzed, dilute aqueous solution, it is not expected that representativeness will be of concern, except when there are potential for changes to process conditions such as the facility influent concentrations or waste processing strategy. Sampling due to these changes in process conditions is addressed in Section B.6.1.3 of this WAP.

The representativeness of a sample may be compromised by the presence of contaminants introduced in the field or the laboratory. To determine if contamination may be present, a blank sample of reagent water is analyzed. A method blank is performed by the laboratory on every batch of 20 samples being analyzed at the same time. The presence of a constituent in the sample and the blank sample indicates contamination has occurred.

### B.7.2.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, expressed as a percentage of the number of valid measurements that were planned to be collected. Lack of completeness is sometimes caused by loss of a sample, loss of data, or inability to collect the planned number of samples. Incompleteness also occurs when data are discarded because they are of unknown or unacceptable quality. Since most regulatory sampling events performed by LERF/200 Area ETF involve a single sample, all analysis must be complete and valid.

### B.7.2.5 Comparability

Comparability is the confidence with which one data set can be compared to another. Comparability is achieved by using sampling and analytical techniques, which provide for measurements that are consistent and representative of the media and conditions measured. In laboratory analysis, the term comparability focuses on method type, holding times, stability issues, and aspects of overall analytical quantitation.

### B.7.2.6 Sensitivity and Detection Levels

Sensitivity is the measure of the concentration at which an analytical method can positively identify and report analytical results. Sensitivity represents the maximum value for a detection level that will reasonably assure the results are below the established limits. The analytical method selected by LERF/200 Area ETF should have a detection level for each constituent that is below the sensitivity. The preferred detection level is the practical quantitation limit (PQL), which is lowest concentration that can be reliably measured during routine laboratory conditions. If the method PQL cannot meet the sensitivity for some constituents, the minimum concentration or attribute that can be measured by a method (method detection limit) or by an instrument (instrument detection limit) may be used. The sensitivity levels, specified in Table B.6, are derived from the delisting limits, water discharge limits, and uncertainty values, which are based on the required precision and accuracy for each constituent.

### B.7.3 Data Generation and Acquisition

The following section addresses QA requirements for data generation and acquisition.

#### B.7.3.1 Sampling Method

LERF/200 Area ETF samples required by the permits and delisting are collected as grab samples. Sampling for the purpose of waste designation of secondary waste is performed using grab, composite, thief, scoop, or composite liquid waste sampler (COLIWASA). The selection of the sample collection device depends on the type of sample, the sample container, the sampling location, and the nature and distribution of the waste components. In general, the methodologies used for specific materials correspond to those referenced to WAC 173-303-110(2). The selection and use of the sampling device is supervised or performed by a person thoroughly familiar with the sampling requirements.

The following protocol applies to all sampling methods:

- All containers will be filled within as short a time period as reasonably achievable.
- Volatile Organic Analysis (VOA) sample containers will be filled first, and prior to any subdividing of a composited sample.
- VOA samples consisting of a set of two or more sample containers will be filled sequentially. The sample containers are considered equivalent and given identical sampling times.
- All VOA sample containers must have no headspace and be free of trapped air bubbles.
- Grab sample protocol includes:
- Sample lines should be as short as reasonably achievable and free of traps and pockets in which solids might settle.
- The sample line should be flushed before sampling with a minimum volume equivalent to three times the sample line volume.
- Contamination to the sample from contact with the internal and external surfaces of the tap should be minimized.

Thief and COLIWASA samplers are used to sample liquid waste containers such as drums. Scoop samplers are used to sample powder waste generated in the thin-film dryer. Sample requirements for these samples include:

- Thief or COLIWASA sampler, the sampler should be lowered into the liquid slowly so the level of the liquid inside and outside the sampler tube remain about the same.
- When lifting the thief or COLIWASA sampler from the solution, the outside should be wiped down, or the excess water allowed to drip off, before filling the sample container.

#### B.7.3.2 Sample Handling, Custody, and Shipping

The proper handling of sample bottles after sampling is important to ensure the samples are free of contamination and to demonstrate the samples have not been tampered with.

##### B.7.3.2.1 Chain-of-Custody

Evidence of collection, shipment, receipt at the laboratory, and laboratory custody until disposal will be documented using a chain-of-custody form. The chain-of-custody form will, as a minimum identify sample identification number, sampling date and time, sampling location, sample bottle type and number, analyses to be performed, and preservation method.

The operations person who signs as the collector on the chain of custody is the first custodian of the samples. A custodian must maintain continuous custody of sample containers at all times from the time the sample is taken until delivery to the laboratory or until delivery to a common carrier for shipment to an off-site location. Custody is maintained by any of the following:

- The custodian has the samples in view, or has placed the samples in locked storage, or keeps the samples within a secured area (e.g., controlled by authorized personnel only), or has applied a tamper-indicating device, such as evidence tape, to the sample containers or shipping containers.
- The custodian has taken physical possession of the samples or the shipping containers sealed with an intact tamper-indicating device, such as evidence tape.

##### B.7.3.2.2 Sample Preservation, Containers, and Holding Time

Table B.6 lists the sample container, preservation method, and holding time requirements for different types of analyses. These parameters are based on the requirements of 40 CFR 136, Table II.

#### B.7.3.3 Instrument Calibration and Preventive Maintenance

LERF/200 Area ETF uses instruments to monitor operations and meet regulatory requirements. This includes continuous pH and conductivity monitors required by facility permits and delisting. All instruments are calibrated according to frequencies and tolerances established by the LERF/200 Area ETF engineering group. Calibrations and other maintenance actions are scheduled and tracked by LERF/200 Area ETF maintenance group using a preventive maintenance database. Measuring and test equipment used for instrument calibration is controlled, calibrated at specified intervals, and maintained to establish accuracy limits.

### B.7.4 Assessment and Oversight

Quality programs can only be effective if meaningful assessments are performed to monitor and respond to issues associated with program performance. Routine assessment of data is performed as part of the validation process discussed in Section B.7.5.1.

#### B.7.4.1 Assessments and Response

Management assessments are conducted by first line management and subject matter experts, focusing on procedural adequacy, compliance, and overall effectiveness of the program. Management assessments of the sample program typically include the LERF and 200 Area ETF QA representative. Each management assessment has a performance objective or lines of inquiry. Examples may include personnel training, proper performance of sample custody, or completeness of sampling records.

#### B.7.4.2 Reports to Management

Results of performance assessments, including any issues identified, are provided to the LERF and 200 Area ETF Facility Manager in a written report. The Facility Manager is responsible to correct all findings from the report.

### B.7.5 Verification and Validation of Analytical Data

The data verification and validation processes will ensure that the data resulting from the selected analytical method are consistent with requirements specified in this QA/QC plan.

#### B.7.5.1 Data Verification

The primary data reporting will be by electronic data systems. Data verification will be performed on laboratory data packages that support environmental compliance to ensure that their content is complete and in order. A review of the data package will be performed to ensure that:

- The data package contains the required technical information
- Deficiencies are identified and documented
- Identified deficiencies are corrected by the laboratory and the appropriate revisions are made
- Deficient pages are replaced with the laboratory corrections
- A copy of the completed verification report is placed in the data file

### B.7.5.2 Data Validation

Data validation ensures that the data resulting from analytical measurements meet the quality requirements specified in the QA/QC plan. Data validation will be performed on data packages that support environmental compliance.

The following are included in data validation:

- Chain-of-Custody – Verify the COC shows unbroken custody from sampling through receipt at the laboratory.
- Request analysis – Review the sample results to verify the requested analysis was performed. If an alternate method was used, verify permit-required detection limits were met.
- Holding times – Review the sample results to verify the analyses were performed within required holing times and where applicable, extraction times.
- Blank – Review the results of trip, field, and equipment blank samples to verify the sample results are not compromised by contamination.
- Laboratory QC – Verify the laboratory QC was completed and there are no outstanding problems

## B.8 REFERENCES

DOE/RL-92-72, *200 Area Effluent Treatment Facility Delisting Petition*, Revision 1, 1993, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1996b, *The Washington State Department of Ecology (Ecology) Regulatory Interpretation of the Liquid Effluent Retention Facility (LERF) Land Disposal Restriction Exemption*, letter from Washington State Department of Ecology to T. Teynor, U.S. Department of Energy and A. DiLiberto, Westinghouse Hanford Company, September 9, 1996.

Ecology, 2000, *Washington State Waste Discharge Permit* (No. ST 4500), as amended, for 200 Area Effluent Treatment Facility, Hanford Facility, Washington State Department of Ecology, Olympia, Washington, August 1, 2000.

EPA, 1983, *Methods for Chemical Analysis of Water Wastes*, EPA-600/4-79/020, (as amended), National Exposure Research Laboratory, Cincinnati, Ohio

EPA, *Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846* (Third Edition, as amended), U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

EPA, 1994, *Liquid Effluent Retention Facility (LERF) Land Disposal Restrictions Treatment Exemption-Regulatory Interpretation EPA/Ecology ID No: WA7890008967*, letter from U.S. Environmental Protection Agency, Region 10 to J. Hennig, U.S. Department of Energy, December 6, 1994.

EPA, 2005, 200 Area ETF Delisting [Exclusion], issued to U.S. Department of Energy, 40 CFR 261, Appendix IX, Table 2 (70 FR 44496, August 3, 2005), U.S. Environmental Protection Agency, Washington, D.C.

## B.9 Analytical Methods, Sample Containers, Preservative Methods, and Holding Times

### Table B.6. Sample and Analysis Criteria for Influent Aqueous Waste and Treated Effluent

| Parameter | Analytical Method[1] | Method PQL Sensitivity [2] | Accuracy/ Precision for Method[3] (percent) | Sample container[4]/ Preservative[4]/ Holding time[5] |
|---|---|---|---|---|
| **VOLATILE ORGANIC COMPOUNDS** | | | | |
| Acetone | SW-846 8260 | 40 | 60-120 / 20 | <u>Sample container</u><br>3 x 40-mL amber glass with septum<br><u>Preservative</u><br>HCl to pH<2; 4°C<br><u>Holding time</u><br>14 days |
| Acetonitrile | | 820 | 60-120 / 20 | |
| Benzene | | 5 | 60-120 / 20 | |
| 1-Butanol | | 1600 | 60-120 / 20 | |
| Carbon Disulfide | | 1500 | 60-120 / 20 | |
| Carbon tetrachloride | | 5 | 60-120 / 20 | |
| Chloroform | | 5 | 50-130 / 20 | |
| Methylene chloride | | 5 | 50-150 / 20 | |
| Tetrachloroethylene | | 5 | 65-140 / 20 | |
| Tetrahydrofuran | | 100 | 60-120 / 20 | |
| **SEMIVOLATILE ORGANIC COMPOUNDS** | | | | |
| Acetophenone | SW-846 8270 | 10 | 70-110 / 25 | <u>Sample container</u><br>4 x 1-liter amber glass<br><u>Preservative</u><br>4°C<br><u>Holding time</u><br>7 days for extraction; 40 days for analysis after extraction |
| Carbazole | | 110 | 50-120 / 25 | |
| p-Chloroaniline | | 76 | 50-120 / 25 | |
| Chrysene | | 350 | 50-120 / 25 | |
| Cresol (o, p, m) | | 760 | 50-120 / 25 | |
| Di-n-octyl phthalate | | 300 | 50-120 / 25 | |
| Diphenylamine | | 350 | 50-120 / 25 | |
| Hexachlorobenzene | | 2 | 50-120 / 25 | |
| Hexachlorocyclopentadiene | | 110 | 50-120 / 25 | |
| Isophorone | | 2600 | 50-120 / 25 | |
| Lindane (gamma-BHC) | | 1.9 | 50-120 / 25 | |
| N-nitrosodimethylamine | | 12 | 50-120 / 25 | |
| Pyridine | | 15 | 50-120 / 25 | |
| Tributyl phosphate | | 76 | 50-120 / 25 | |
| 2.4.6-Trichlorophenol | | 230 | 50-120 / 25 | |

## Table B.6. Sample and Analysis Criteria for Influent Aqueous Waste and Treated Effluent

| Parameter | Analytical Method[1] | Method PQL Sensitivity [2] | Accuracy/ Precision for Method[3] (percent) | Sample container[4]/ Preservative[4]/ Holding time[5] |
|---|---|---|---|---|
| **POLYCHLORINATED BIPHENYLs (PCBs)** | | | | |
| Aroclor-1016 | SW-846 8082 | 0.4 | 50-110 / 25 | Sample container<br>4 x 1-liter amber glass<br>Preservative<br>4ºC<br>Holding time<br>1 year for extraction; 1 year for analysis after extraction |
| Aroclor-1221 | | 0.4 | 50-110 / 25 | |
| Aroclor-1232 | | 0.4 | 50-110 / 25 | |
| Aroclor-1242 | | 0.4 | 50-110 / 25 | |
| Aroclor-1248 | | 0.4 | 50-110 / 25 | |
| Aroclor-1254 | | 0.4 | 50-110 / 25 | |
| Aroclor-1260 | | 0.4 | 50-110 / 25 | |
| **TOTAL METALS** | | | | |
| Arsenic | EPA-600 200.8 | 11 | 70-130 / 20 | Sample container<br>1 x 0.5-liter plastic/glass<br>Preservative<br>1:1 $HNO_3$ to pH<2<br>Holding time<br>180 days; mercury 28 days |
| Cadmium | | 5 | 70-130 / 20 | |
| Chromium | | 20 | 70-130 / 20 | |
| Copper | | 70 | 70-130 / 20 | |
| Lead | | 10 | 70-130 / 20 | |
| Mercury | | 2 | 70-130 / 20 | |
| Selenium | | 20 | 70-130 / 20 | |
| Barium | SW-846 6010/ EPA-600 200.7 | 1200 | 75 - 125 / 20 | |
| Beryllium | | 34 | 75 - 125 / 20 | |
| Calcium | | 200 | 75 - 125 / 20 | |
| Iron | | 100 | 75 - 125 / 20 | |
| Magnesium | | 400 | 75 - 125 / 20 | |
| Nickel | | 340 | 75 - 125 / 20 | |
| Potassium | | 10,000 | 75 - 125 / 20 | |
| Silicon | | 580 | 75 - 125 / 20 | |
| Silver | | 83 | 75 - 125 / 20 | |
| Sodium | | 2500 | 75 - 125 / 20 | |
| Vanadium | | 120 | 75 - 125 / 20 | |
| Zinc | | 5100 | 75 - 125 / 20 | |
| **GENERAL CHEMISTRY** | | | | |
| Chloride | EPA-600 300.0 | 1000 | 70-130 / 20 | Sample container<br>1 x 60-mL plastic/glass<br>Preservative<br>4°C<br>Holding time<br>28 days; nitrate and nitrite 48 hours |

## Table B.6. Sample and Analysis Criteria for Influent Aqueous Waste and Treated Effluent

| Parameter | Analytical Method[1] | Method PQL Sensitivity [2] | Accuracy/ Precision for Method[3] (percent) | Sample container[4]/ Preservative[4]/ Holding time[5] |
|---|---|---|---|---|
| Fluoride | | 880 | 70-130 / 20 | |
| Formate | | 1250 | 70-130 | |
| Nitrate (as N) | | 100 | 70-130 / 20 | |
| Nitrite (as N) | | 100 | 70-130 / 20 | |
| Phosphate | | 1500 | 70-130 / 20 | |
| Sulfate | | 10,000 | 70-130 / 20 | |
| Ammonia (as N) | EPA-600, 300.7 | 40 | 70-130 / 20 | <u>Sample container</u><br>1 x 50-mL glass or plastic<br><u>Preservative</u><br>$H_2SO_4$ to pH<2; 4°C<br><u>Holding time</u><br>28 days |
| Cyanide | EPA-600 335.2/335.3 | 350 | 70-130 / 20 | <u>Sample container</u><br>1 x 250-mL glass or plastic<br><u>Preservative</u><br>NaOH to pH>12; 4°C<br><u>Holding time</u><br>14 days |
| Alkalinity | EPA-600 310.1/310.2 | ND | ND | <u>Sample container</u><br>1 x 50-mL glass or plastic<br><u>Preservative</u><br>4°C<br><u>Holding time</u><br>14 days |
| Total dissolved solids | EPA-600 160.1 | ND | ND | <u>Sample container</u><br>1 x 500-mL glass or plastic<br><u>Preservative</u><br>4ºC<br><u>Holding time</u><br>7 days |
| Total suspended solids | EPA-600 160.2 | ND | ND | <u>Sample container</u><br>1 x 1-L glass or plastic<br><u>Preservative</u><br>4ºC<br><u>Holding time</u><br>7 days |
| Specific conductivity | EPA-600 120.1 (in lab) | ND | ND | <u>Sample container</u><br>1 x 50-mL glass or plastic<br><u>Preservative</u><br>4ºC<br><u>Holding time</u><br>28 days |
| pH[7] | EPA-600 150.1 | ND | ND | <u>Sample container</u><br>1 x 60-mL glass or plastic<br><u>Preservative</u><br>None<br><u>Holding time</u><br>Analyze immediately |

## Table B.6. Sample and Analysis Criteria for Influent Aqueous Waste and Treated Effluent

| Parameter | Analytical Method[1] | Method PQL Sensitivity[2] | Accuracy/ Precision for Method[3] (percent) | Sample container[4]/ Preservative[4]/ Holding time[5] |
|---|---|---|---|---|
| Total organic carbon | SW-846 9060 | ND | ND | Sample container<br>1 x 250-mL amber glass<br>Preservative<br>$H_2SO_4$ to pH<2; 4°C<br>Holding time<br>28 days |

[1]SW-846 or EPA-600 methods are presented unless otherwise noted. Other methods might be substituted if the applicable PQL can be met.
[2]ST-4500 required method PQL or Delisting Exclusion condition 2 report sensitivity/detection level, whichever is lower. Units are parts per billion unless otherwise noted.
[3]Accuracy/precision used to confirm or re-establish MDL
[4]Sample bottle, volumes, and preservatives could be adjusted, as applicable, for safety reasons
[5]Holding time = time between sampling and analysis
[7]pH monitored in influent aqueous waste only
L = liter
mL = milliliter
NA = not applicable
ND = not determined
MDL = method detection level
PQL = practical quantitation limit
RL = reporting limit

## Table B.7. Sample Containers, Preservative Methods, and Holding Times for 200 Area ETF Generated Waste

| Parameter | Analytical Method | Method PQL | Accuracy/ Precision for Method (percent) | Sample container[1]/ Preservative[1]/ Holding time[2] |
|---|---|---|---|---|
| **Liquid Matrix** | | | | |
| For methods other than total solids, analyze using the methods and QA/QC in Table B.6. For each method, analyze the target compound list | | | | |
| Total solids | EPA-600 160.3 | ND | ND | <u>Sample container</u><br>1 x 500-mL glass or plastic<br><u>Preservative</u> – 4°C<br><u>Holding time</u> –7 days |
| **Solid Matrix** | | | | |
| Volatile organic compounds (combined method target compound lists) | SW-846 8260 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>1 x 40-mL amber glass with septum<br><u>Preservative</u> –4°C<br><u>Holding time</u> –14 days |
| Semivolatile organic compounds (method target compound list) | SW-846 8270 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>1 x 125-mL amber glass<br><u>Preservative</u> –4°C<br><u>Holding time</u> –14 days for extraction; 40 days for analysis after extraction |
| PCBs (method target compound list) | SW-846 8082 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>Amber glass – 50 g of sample<br><u>Preservative</u> –4°C<br><u>Holding time</u> –1 year for extraction;<br>1 year for analysis after extraction |
| RCRA Metals (method target compound list) | EPA-600 200.8 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>glass or plastic – 10 g of sample<br><u>Preservative</u> –none, mercury 4°C<br><u>Holding time</u> –180 days; mercury 28 days |
| Total Metals (method target compound list) | SW-846 6010 | Refer to Table B.6 | Refer to Table B.6 | |
| Anions (method target compound list) | EPA-600 300.0 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>glass or plastic –25 g of sample<br><u>Preservative</u> –none<br><u>Holding time</u> –6 months for extraction; 28 days for analysis after extraction, nitrate and nitrite 48 hours for analysis after extraction |
| Ammonia | EPA-600 300.7 | Refer to Table B.6 | Refer to Table B.6 | <u>Sample container</u><br>glass or plastic – 25 g of sample<br><u>Preservative</u> –none<br><u>Holding time</u> –6 months for extraction; 28 days for analysis after extraction |
| pH | SW-846 9045 | ND | ND | <u>Sample container</u><br>glass or plastic – 50 g of sample<br><u>Preservative</u> –none<br><u>Holding time</u> –none |

## Table B.7. Sample Containers, Preservative Methods, and Holding Times for 200 Area ETF Generated Waste

| Parameter | Analytical Method | Method PQL | Accuracy/ Precision for Method (percent) | Sample container[1]/ Preservative[1]/ Holding time[2] |
|---|---|---|---|---|
| Toxicity Characteristic Leaching Procedure[3] | SW-846 1311 | NA | NA | Sample container<br>Refer to specific method being performed after TCLP – 125 g of sample<br>Preservative –None (after TCLP, preserve extract per method being performed)<br>Holding time –Metals: 180 days for TCLP extraction, mercury 28 days for TCLP extraction<br>SVOA: 14 days for TCLP extraction (after TCLP, refer to specific methods for time for analysis after extraction) |

[1] Sample bottle, volumes, and preservatives could be adjusted, as applicable, for safety reasons
[2] Holding time equals time between sampling and analysis
[3] Extraction procedure, as applicable; extract analyzed by referenced methods [WAC 173-303-110(3)(c)]
g = grams
NA = not applicable
PQL = practical quantitation limit
mL = milliliter
ND = not determined
TCLP = toxicity characteristic leaching procedure